JOURNAL

NOVEMBER, 1932

Wm. J. McKEEN

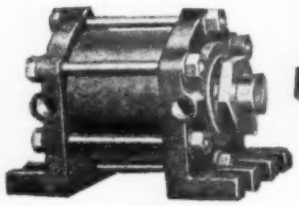
"HOPKINS" PREFERRED EQUIPMENT

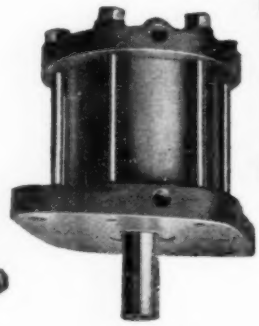
"QUALITY AND SERVICE"
IS THE SLOGAN FOR

HOPKINS —— NON-ROTATING
DOUBLE-ACTING CYLINDERS

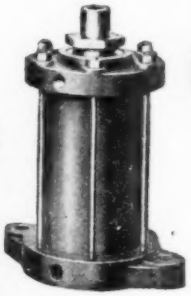
AIR OR HYDRAULICALLY
OPERATED.

IN ALL
DESIRED
CAPACITIES.


STYLE 1


STYLE 2

STYLE 3


STYLE 4

STYLE 5

STYLE 6

Below—Style 2
Cyl. Cushioned
on Both Ends

ALL STYLES —
MAY BE FURNISHED
CUSHIONED ON BOTH ENDS
OR ON EITHER END.—

DETROIT REPRESENTATIVE
HABERKORN & WOOD

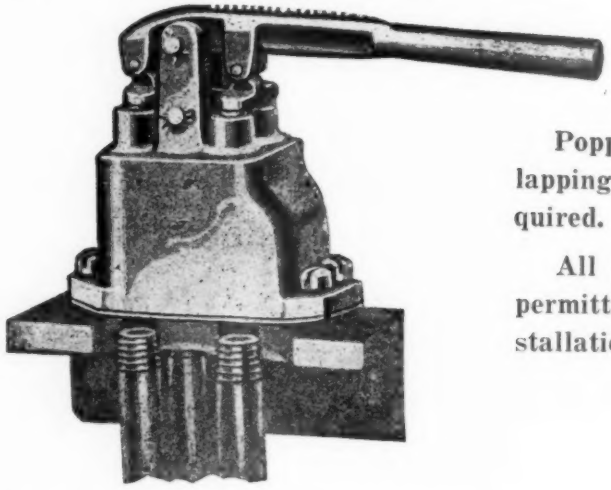
THE TOMKINS-JOHNSON CO.

MFG. BY

624 NO. MECHANIC ST., JACKSON, MICH.

Ross Operating Valves

The Bridle For Air Horsepower



For the control of single and double acting cylinders.

Hand, foot or mechanical control.

Poppet type with no lapping or grinding required.

All parts on one face permitting permanent installation of all piping.

Made in all sizes to meet requirements.

ROSS OPERATING VALVE COMPANY

6488 EPWORTH BLVD., DETROIT, MICH.

A. S. T. E. Journal

Published by the American Society of Tool Engineers

8316 Woodward Avenue

Detroit, Michigan

J. A. Siegel, President

W. H. Smila, First Vice-President

E. J. Ruggles, Second Vice-President

A. M. Sargent, Secretary

W. J. Fors, Treasurer

Copyright 1932 by American Society of Tool Engineers

Published for Members Only

VOL. 1. NOVEMBER, 1932 No. 7

Table of Contents

Announcement of Next Meeting ..... Page 7
Editorial Page ..... " 8
Membership Drive ..... " 9
The Chronolog ..... " 10
Draw on the Bank of Experience ..... " 11
Machine Age ..... " 12
News Notes of the Industry ..... " 13
Strength of Materials ..... " 14
Tool Engineering Bulletin No. 9 ..... " 15
Tool Engineering Bulletin No. 10 ..... " 16
A Tool Engineering Project ..... " 17

Owing to the nature of the American Society of Tool Engineers organization, it cannot be responsible for statements appearing in the Journal either as advertisements or in papers presented at its meetings or the discussions of such papers printed herein.

EDITED BY THE PUBLICITY COMMITTEE

Ford R. Lamb, Chairman

O. B. Jones — Ed. A. Rutt
W. C. Maier — W. J. McKeen
F. H. Hartlep — Hans Hanson
C. J. Erickson — E. R. DeLuiz
Don W. Patterson — O. W. Winter
H. C. Hoover

Address all communication relative to editorial matter and copy to Publicity Committee, 8316 Woodward Ave., Telephone: MAdison 5048.

LAMB

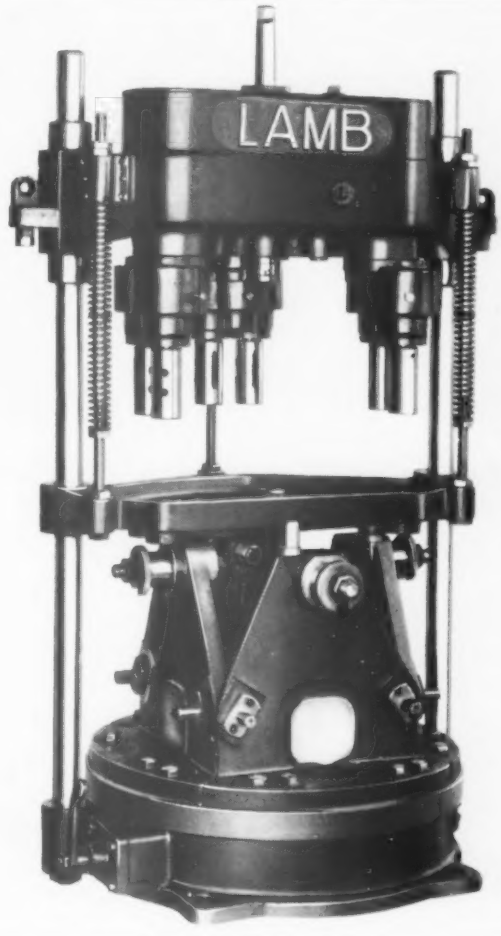
MULTIPLE EQUIPMENT

COMBINES

ACCURACY QUALITY

AND

DEPENDABILITY



Lamb Multiple Head with Bushing Plate—Fixture and Index Table

— ♦ — ♦ —

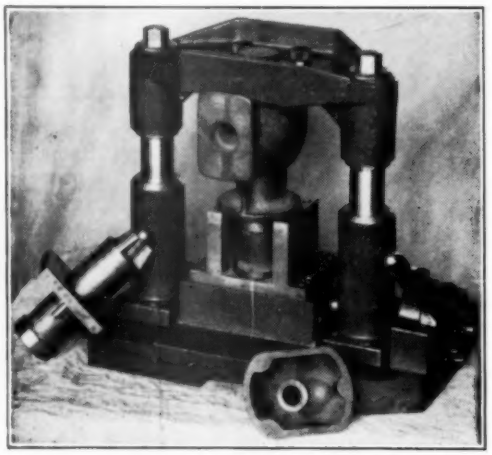
F. JOS. LAMB CO.

DETROIT, MICH.

6343 Wight St. Fitzroy 5382

Complete STANDARDIZATION of Fixture Units.

Only the QUICK-CLAMP line affords this desirable feature.
Years of thought and expense devoted to this single purpose, so that you may expedite the design of your tools and reduce their cost.



UNIBUILT Q. C. FIXTURE.
Tooled for Drilling Two Parts for Gas Pump.

Here are a few of the items.

Fixture locks (4 Sizes)
Racks (2 Types)
Pinions (2 Types)
Cam shafts
Cams (2 Types)
Guide bars
Housings
Socket wrench handles
Posts (2 Types)
Washers and Nuts
Locating Pins and Retainers.

In addition to these we have 703 sizes of standardized drill jigs, included in 12 types, compare this with what others offer, and last but not least PRICES ARE SUCH AS TO SHOW A REMARKABLE SAVING OVER OTHER PRODUCTS OF A SIMILAR NATURE.

EXCLUSIVE DISTRIBUTOR

1310 MAPLE ST. **A. H. PEARSON** CADILLAC 3419

To those we serve we say, "Thank you."

To those we have not, may we suggest that it would be to our mutual advantage if we be granted the opportunity to demonstrate our ability to serve you on your needs for

Dies, Jigs, Fixtures, and Special Machinery

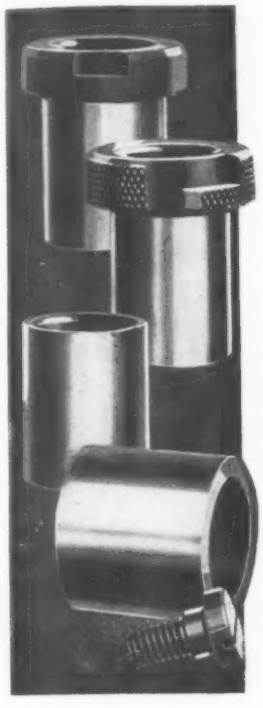
A COMPLETE DESIGNING SERVICE IF DESIRED.

ACE TOOL AND DIE CO.

1310 MAPLE ST. DETROIT, MICH.

Cadillac 3419

Manufacturers of Q-C Products



A Type, Size and Length of Bushing for Every Drilling Requirement

THERE is an Ex-Cell-O Drill Jig Bushing to meet every requirement. More than 250,000 bushings are constantly on hand ready for immediate shipment. Head or headless press fit, plain renewable or slip-knurled head renewable types, in lengths from $\frac{3}{32}$" to 2½", drill sizes from #55 to 2".

Ex-Cell-O Bushings are made from high grade steel, hardened and ground to extremely close limits. Accuracy and uniform hardness insures long wear and cuts drill breakage to a minimum. They are actually priced lower than the cost of making a similar bushing in your own shop.

EX-CELL-O
Aircraft XLO *& Tool*
Corporation

1200 Oakman Blvd. **Detroit, Mich.**

THE (MICROPOISE) DETECTS

AN UNBALANCE OF 0.2 OUNCE INCHES

It locates the unbalance and measures the exact depth of drill to correct it.

Constructed for production balancing, it is fast and extremely simple to operate. No troublesome adjusting screws, springs, knife edges, cutmeters, slide rule, or dash pots.

Parts on which accuracy depends can be replaced in five minutes at a very slight cost!

Write for details!

For balancing automobile wheels, tires, flywheels, clutches, fan pulleys, pump impellers and crankshafts.

Commerce Pattern Foundry & Machine Co.

2211 GRAND RIVER AVE. DETROIT, MICH.

HABERKORN & WOOD
2208 West Fort St.
DETROIT, MICH.

Exclusive Representatives

— on —

MINSTER PRESSES
Inclinable — Horning — Knuckle
Straight Side and Gap

KENT-OWENS — Milling Machines

HOPKINS — Air and Hydraulic Equipment

PROVIDENCE—High Speed Drilling Machines

MIAMI—The Adjustable Fixed Center Multiple Drill Head

GROTNES — Special Wheel Machinery

AVERBECK — SHAPERS

TUTHILL — Pumps

ANDERSON STEEL PROCESS

STEEL TREATERS

WE SPECIALIZE in TOOL and DIE HARDENING

CARBONIZING, CYANIDING

—♦—

Day and Night Pick-up Delivery Service

—♦—

1337 MAPLE PHONE CHERRY 3802

DETROIT, MICH.

THE CHRONOLOG

An Instrument for Control of Idle Time and for Lower Production Costs.

Distributed by

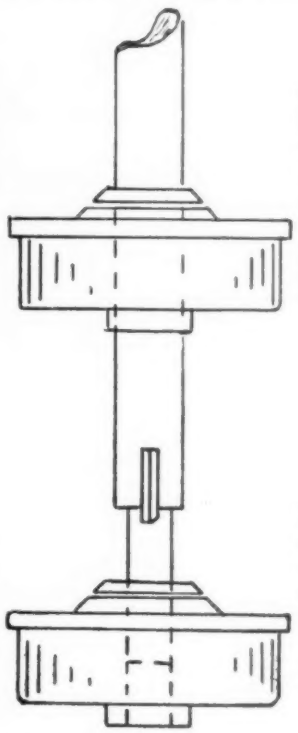
GRAYBAR ELECTRIC CO.
Offices in Principal Cities.

Manufactured by

THE NATIONAL ACME CO.

"IT'S IN THE COMBINATION"

The **National** Carbide Boring Tool—*plus*—the National Rotary Bushing makes a perfect boring set-up.



National Carbide Boring Tools save operations—improve work—multiply output and increase profit.

—♦—

—♦—

We specialize in the building of boring tools (Bars) for any purpose and of any design.

National Rotary Bushings eliminate vibrations and friction—make holes round and smooth.

NATIONAL BORING TOOL CO.
1312 MT. ELLIOTT AVE. DETROIT

Next meeting: Thursday, November 10, 1932.
Detroit Leland Hotel,
Colonnade Room.
Eight o'clock.

Speakers:
Mr. Schafer;
Subject:
"The Manufacture of Glass"
Mr. O. B. Jones;
Subject:
"The Tool Engineer's Place in Mass Production"

MR. O. B. JONES

MR. SCHAFER

Mr. O. B. Jones is a graduate of the Tri-State College of Engineering. His education was interrupted by the war, and he served at Camp Sherman, Chillicothe, Ohio, giving trade tests to soldiers. The war ended, he returned to college, and graduated in 1919.

Mr. Jones has worked for the Barker Manufacturing Company, Springfield, Massachusetts; the Franklin Die, Tool and Machine Company, Columbus, Ohio; Willys-Overland Company, Toledo, Ohio; Sparks - Withington Company, Jackson, Michigan; Michigan Stamping Company, Detroit, Michigan; Studebaker Corporation, Detroit, in the capacities of tool-room foreman, chief tool designer, and so on. He is an author of texts on Tool Design, Mathematics, and Mechanics. At present, Mr. Jones is President of the Detroit College of Applied Science.

After receiving his Engineering education in Germany, Mr. Schafer came to America where he worked as Tool Designer in the Automotive Industry in Detroit, Michigan. For the last four years he has been connected with the Libbey Owens Ford Glass Company, Toledo, Ohio.

Mr. Schafer has chosen the "Manufacture of Glass" for his subject at the meeting. A motion picture will be shown, illustrating the manufacture of window, plate, and safety glass.

Mr. Schafer is a member of the Research Staff of the Libbey Owens Ford Glass Company.

EVERYBODY WELCOME!

General meetings of the American Society of Tool Engineers are not closed to non-members. Anyone engaged in tool or machine work is welcome to attend, regardless of whether he belongs to the Society or not.

EDITORIAL PAGE

A BIT OF FANTASY

There was a time when all of man's engineering avtivities were carried out under the one name engineering. The engineer was one who built bridges; designed and improved the relatively simple machinery of the age between James Watt and the day when electricity began to have applications other than amusement for audiences at demonstrations; planned and constructed city water and drainage systems; and so on. But now we have many types of engineer specialists classified as Mechanical, Chemical, Electrical, Civil, Structural, Production, Industrial, Tool, and even Sales Engineers.

What further kinds of engineering will tomorrow bring us? Who knows but that in the not very distant future we shall see Biological, Psychological, and Sociological Engineers working marvels that will make our present achievements in the material sciences seem like child play?

Already there is a considerable body of knowledge, capable of practical application, and even actually being applied in some small ways, that deserves the dignity of the name Biological Engineering. Have not stock breeders, for scores of centuries, improved their cattle, sheep, horses, and fowl by selecting specimens for mating in accordance with desired qualities and variations in new directions? The many breeds of pigeons in existence today were all derived from a common, single species of pigeon, and the several hundred variations of this species, showing a bewildering variety of plumage, shape, and sizes, were all developed by selective breeding in the hands of pigeon fanciers. What is this but Biological Engineering?

It is interesting to speculate on the possible applications of selective breeding to the human race. The conception of human Biological Engineering is as old as Plato, who advocated the breeding of a better human race, both physically and mentally, by the restriction of mating to those superior individuals chosen by the philosophic rulers of his ideal state, sketched in *The Republic*.

Wild as this suggestion may seem, repugnant as the idea of human stock farming may be to most of us, an application of the idea is embodied in one of the laws of the State of California. This law calls for the sterilization of the feeble minded and inmates of insane asylums. Thus, this defective strain will be eliminated, through prevention of its perpetuating itself. Human Biological Engineering thus is already a reality, though only in a negative way.

Not so long ago, a proposal for positive human Biological Engineering was advanced by an English woman of some standing as a writer on social questions. She suggested that one superior male, embodying all the ideal qualities, both physical and mental, we look up to in a perfect specimen of man, alone be allowed to propagate the human race. The females to bear his off-spring were also to be carefully selected on the basis of ideal feminine qualities. All the rest of the human race were to be mercilessly sterilized. Thus, the Super-Man, sung and heralded by Nietzsche, was to be bred into existence. But I venture the opinion that such a plan would meet with some *slight* opposition from all but the fortunate male and female consorts chosen. Also, who would do the selecting? There is no agreement as to what constitutes physical and mental perfection.

Various indications presage the coming of a science of Psychological Engineering. What is education, after all, but Psychological Engineering in the first stage? We exert such influences on our young that they will develop into the adults we need to carry on our traditions of civilization and progress. But the science of Psychological Engineering is still woefully inadequate. Our schools and universities do not turn out a production of uniformly excellent quality; it must be conceded that many lunk-heads still come out of our educational institutions. But who knows that Psychological Engineering may yet reach the fine point where we can turn out individuals who will enjoy a symphony more than a game of bridge, a debate between Einstein and Bertrand Russell on relativity more than a swat-fest between Schmeling and Walker?

As for Sociological Engineering, our politicians are the pitiable proofs of the present low development of that science. They delude themselves that 18th century political and economic doctrines are applicable to a 20th century industrial technology, and make a religion of these hoary heirlooms of a by-gone age.

But perhaps, some day, we may get a Sociological Engineering that will enable us to solve even the problems of prohibition, taxation, technological unemployment, and the tariff.

Rev. Good (at baptism): His name, please?

Mother: Algernon Philip Percival Reginald Mortimer Duckworth.

Rev. (to his assistant): A little more water, please.

Plastered One: "Whash yer looking for?"

Policeman: "We're looking for a drowned man."

Plastered One: "Wash yer want one for?"

A NAME FOR IT

"Brethern, we mus' do somethin' to remedy de status quo," said a colored preacher to his congregation.

"Brother Jones, what am de status quo?" asked a member of his parish.

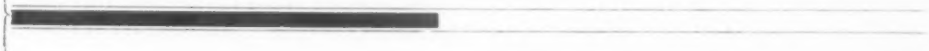
"Dat, brother," said the preacher, "am Latin for de mess we's in."

MEMBERSHIP DRIVE

The race for getting the greatest number of new members for the AMERICAN SOCIETY OF TOOLS ENGINEERS is on. At this moment the team of which Mr. F. L. Hoffman is Captain appears to be in lead, but it is still anybody's race. All the teams have still a chance for that big dinner at the expense of the other teams. Go to it boys, and may the best team win!

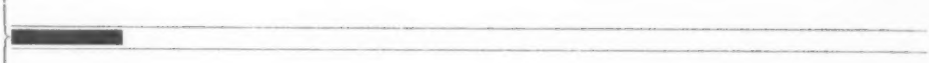
1. C. B. SMITH, *Captain*

2. F. L. HOFFMAN, *Captain*



3. WM. (BILL) GRAY, *Captain*

4. E. C. MacKenzie, *Captain*



5. GEO. E. LEGGATT, *Captain*

6. EDWIN LANG, *Captain*

7. K. F. RANGER, *Captain*

8. JOE SLAVIK, *Captain*

9. A. H. HOFFMAN, *Captain*

10. WM. PETERSON, *Captain*

IMPORTANT

Members of the Society having extra copies of the May and June issues of the Journal, please get in touch with Mr. Sargent, Secretary of the American Society of Tool Engineers, 8316 Woodward Ave.; Telephone: Madison 2057. These issues are needed for completing the files of the Society.

THE CHRONOLOG

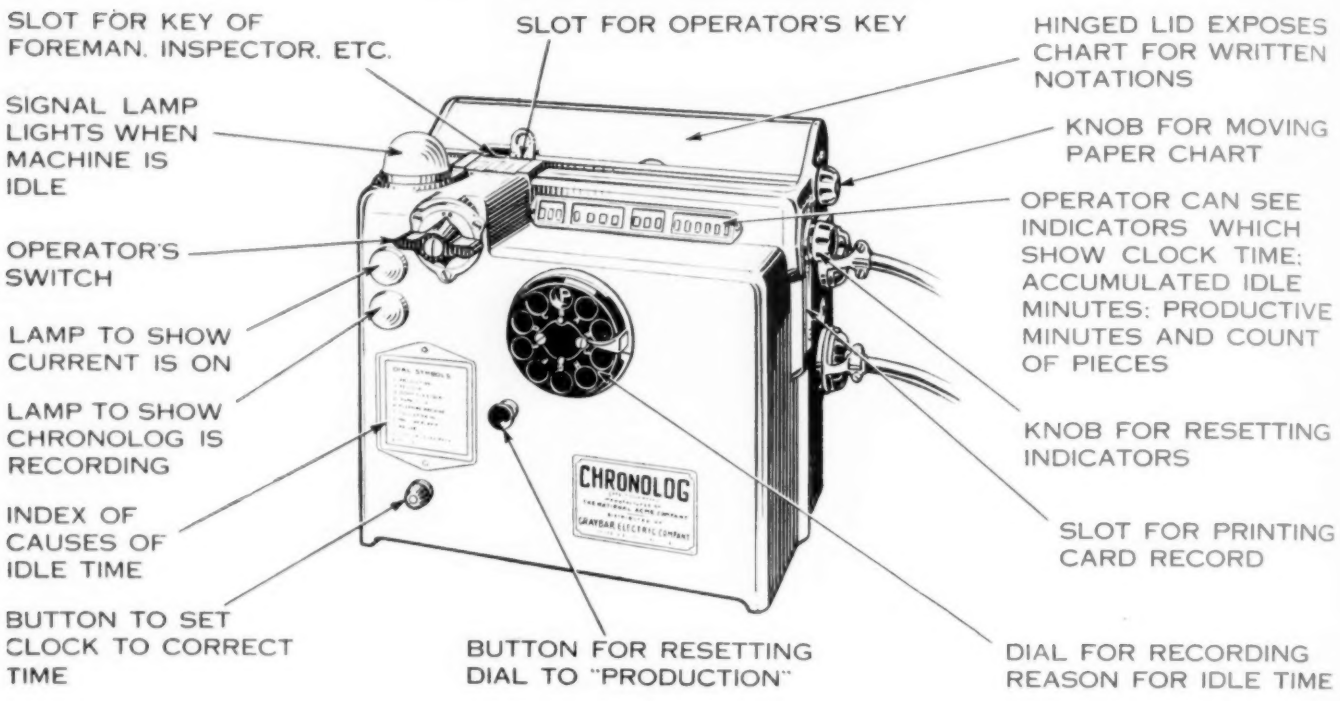

SLOT FOR KEY OF FOREMAN, INSPECTOR, ETC.
SLOT FOR OPERATOR'S KEY
HINGED LID EXPOSES CHART FOR WRITTEN NOTATIONS
SIGNAL LAMP LIGHTS WHEN MACHINE IS IDLE
KNOB FOR MOVING PAPER CHART
OPERATOR CAN SEE INDICATORS WHICH SHOW CLOCK TIME; ACCUMULATED IDLE MINUTES; PRODUCTIVE MINUTES AND COUNT OF PIECES
OPERATOR'S SWITCH
LAMP TO SHOW CURRENT IS ON
LAMP TO SHOW CHRONOLOG IS RECORDING
KNOB FOR RESETTING INDICATORS
INDEX OF CAUSES OF IDLE TIME
SLOT FOR PRINTING CARD RECORD
BUTTON TO SET CLOCK TO CORRECT TIME
BUTTON FOR RESETTING DIAL TO "PRODUCTION"
DIAL FOR RECORDING REASON FOR IDLE TIME
CHRONOLOG

Fig. 1. The Chronolog.

At the October meeting of the ASTE at the Detroit Leland Hotel, Mr. TELL BERNA of the NATIONAL ACME COMPANY, Cleveland, Ohio, gave a very interesting demonstration and description of the CHRONOLOG, a new device for accurate production control. The machine, which was set up at the meeting, together with lantern slides, aided Mr. Berna to make this subject very interesting, although Mr. Berna would be interesting without any aid.

The Chronolog was developed and is produced by the National Acme Company, and distributed by the Graybar Electric Company. It is a device which can be applied to practically any machine or operation which is subjected to interruption, and gives in visual form a constant record of the machine. It also tabulates this information on a printed record, which may be studied and field for future reference.

Industry is very interested in idle time—both of men and machines, and the Chronolog makes a record of just what goes on at the machine or operation at all times. It shows the time the operator arrives at the machine in the morning, records the number of pieces produced, the number of minutes the machine was producing, the number of minutes the machine was idle, and the reason for the machine being idle. Not only that, but it records promptness of arrival of stock, the promptness of arrival of machine repair men in case of repair, the time required for set up, tool changing, tool grinding, inspection, and the amount of time the operator is away from the machine for personal reasons.

Give a foreman or supervisor a record like this and there is something wrong if he can't produce results. Every moment of non-productive time is listed for him so that he can devise ways of reducing or eliminating the cause of non-productive time. Mr. Berna described operations where the use of the Chronolog increased production in some cases as much as 100 per cent.

The Chronolog chart shown of the following page illustrates the record made on the machine similar to the installation shown. Incidentally, the Chronolog caused an increase in production on this machine from 1000 to 1600 pieces per day the first day. The second day production went up to 1844 pieces, and this approximate production was maintained for the balance of the job.

The chart record shows that operator No. 1234 started work (at the machine) at 6:04 A. M. He immediately dials "S" which indicates set-up time. The machine records at 5 minute intervals all day, in addition to the records made by the operator or others. (The machine can be set to record at shorter or longer intervals as desired.) He works on set-up and adjusting tools until 6:21 A. M., when he is ready to proceed but must wait for stock, so he dials "13" (down for stock). Stock handler

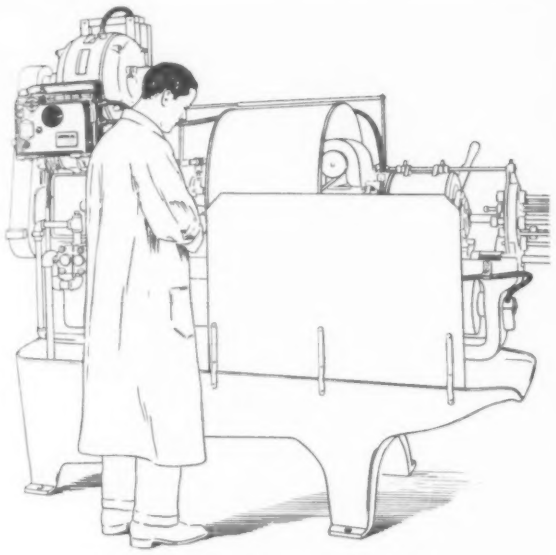


Fig. 2. The Chronolog in place.

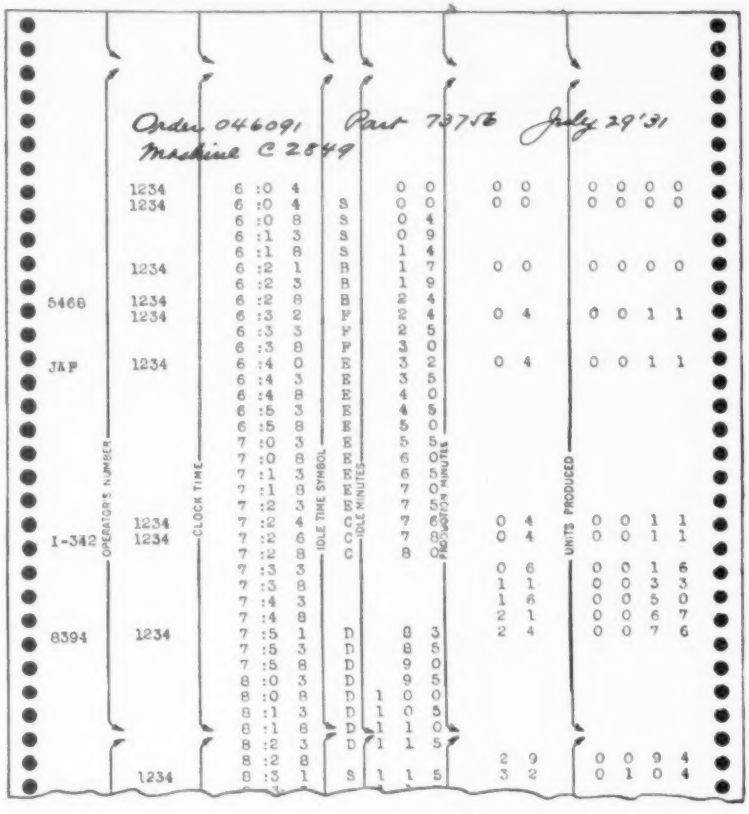


Fig. 3. Beginning of a Chronolog chart.

No. 5468 reports at 6:28. The operator then starts production, but at 6:32 has machine trouble, so he shuts down with only 11 pieces made. He dials "F" (machine repair). Note that the record shows that J. A. F. appeared at 6:40. J. A. F. is the foreman, and he noticed the red light which automatically went on when the operator stopped the machine, and came to see the cause of the shut-down. He directs the operator to regrind one of the tools, so the operator dials "E" (tool grinding), which takes until 7:24. At this time he dials "C" (inspection), and the record shows that inspector I-342 got there in two minutes, at 7:26. Shortly after, at 7:28, the machine is producing, and runs until 7:51, when the machine cleaner No. 8394 arrives to clean the chips which have accumulated. He dials "D" (cleaning machine), and is through at 8:23. At 8:31 the operator has to stop for "S" (set up) to adjust tools. And so on through the day. Note from the chart that all idle minutes are totaled as they occur, and all productive minutes are recorded as they occur.

This record is removed at the end of the day, and is available for study with the end in view of devising means of reducing the idle minutes.

Mr. Berna described how the operators "take to" this devise at once, for, as one operator put it, "it makes the foreman get off his seat as well as it checks me up, and furnishes me an alibi for the things I can't help."

DRAWN ON THE BANK OF EXPERIENCE

By F. H. HARTLEP

Every one of us has inherited all of the good things from the past.

You and I build our results of today and tomorrow upon the facts which we and other practical and technical men learned yesterday, last year, and long ago.

Valuable ideas represent deposits in the Bank of Manufacturing Experience, and we have a checking account on the fund. It is ours to use, and, unlike an ordinary bank, there is no danger of an overdraft.

Experience is a remarkable thing in that it makes a profit which is cashable, but is not confined to any one section of the world, any one line of manufacturing, or any single group of men—the more it is used the more it multiplies.

Even though you know all the facts and suggestions presented in this Journal—even then they will be worth the little time required to read them, because they will refresh your memory on points of great value.

The Battleaxe (sarcastically): I suppose you've been to see a sick friend, holding his hand all evening!

Mr. Henpeck (sadly): If I'd been holding his hands I'd have made some money.

Style dictates that women's dresses are to be worn longer—one or two years.

MACHINE AGE

By RUSSELL E. LAWRENCE
President, Lawrence Institute of Technology, Detroit, Mich.

To classify this age as the Machine Age is certainly giving our Mechanized Industry a prominence quite flattering. The era we style the machine age has existed less than a century and less than a decade at its present efficiency. It is peculiar in that its only excuse for existing is based upon producing non-essentials of life; in many cases pure luxuries. By using intensively the forces of nature, man has been able to devote most of his attention to coddling himself.

All of this, however, has lifted man from the condition of a child of Nature to the adult civilization of today, with its mighty forces of mental power. One can but feel that we are rapidly getting closer to the peak of civilization by the utilization of these wonderful secrets of nature, which the Master Scientist has created for our benefit, since the beginning of the world.

But there are many who fret and shout their fears that we are headed toward destruction. They believe our Mechanized Industry to be a gigantic monster designed for legal slavery, and for the benefit of the few. This depression, they tell us, proves their theory.

The Age of Invention has come upon us so rapidly, that socially and politically, we have not kept pace with it. Hence the depression has given us a much needed rest period for re-adjustment and reflection. Only good can possibly result.

As we reflect upon the past we see our mistakes and recognize our progress, as well. I am sure the progress warrants the mistakes. For no one would prefer the civilization of fifty years ago to that of today.

Some of the short-comings that have brought us to a standstill are over-indulgence, immigration disturbance, a scarcity of competent managers, deficiency in organized industries, and a need for a stabilizing factor. Added to these are need for increase in wages and more buying hours for the consumer, gross lack of sound financial engineering, and a disregard for the law of master and servant.

First, by over-indulgence I mean that too many industries have tried mechanization. Their market did not warrant mass production. Many commodities went the route of fads, with a wave of popularity and quick oblivion. This past period of prosperity might be recorded as the "Gold Rush" of the Twentieth Century; where men forgot their God and their responsibility to their fellow man. A survival of the fittest existed as in prehistoric times. Many staked a good claim. They control the wealth of the nation. But now, in the calm of reflection, they find their wealth an unwieldy burden that controls their very lives. The old incentives for becoming rich have, by the machine age, been made available for the masses; there is but one real incentive left for wealth, and that is philanthropy.

Because of immigration disturbance, we have had no chance to build a culture of our own. It is impossible to standardize our buying public and our labor. Immigration, together with our natural increase in population, is in conflict with the increase in Mechanization, and makes it necessary that new industries be rapidly established in order to furnish employment for these masses. However, the increase of mechanization has been winning the race.

The "Old Man" problem might be solved by these shorter periods of work. It is now necessary to extend the job of the workman by giving him less hours per week to work. The time of human obsolescence surely would be lengthened by giving the mind a shorter period of monotony a day and the nerves fewer noise shocks to endure per week.

It might be well to reflect at this time on the result of suddenly destroying a stable industry. Such was the case produced by the 18th Amendment. It would have been better for Congress to have created a new industry for those millions of workers beforehand. The shock and difficulty of enforcement could have thus been obviated. We must continue to have new inventions such as the airplane, the radio, the automobile and refrigeration, that create new industries, if we are to continue to assimilate immigrants and our own offspring; or we are faced by the alternative of extending the job, by reducing the daily average working hours per man.

With the increase in Mechanization, the value of brain-power in Industry became all-important. Yet a scarcity of executive material has been starving scientific management. True, our Universities have been supplying thousands of graduates yearly, and they have been absorbed by an Industrial Country. But likewise our immigrants also have been absorbed. The qualities required for executives are not limited to well disciplined minds. There are the absolute requirements of character, personality and health. Unless these characteristics are carefully molded into a student's training, his induction into industry will produce a sort of aristocracy in the shop. The social breach between the production worker and the executive will be widened. A student or graduate to be of use to Industry, must by actual experience, suffer har work and meager wages. And it is only through an extensive apprenticeship of responsibilities in the shop, working directly with the men of the shop, that he will receive the character training that makes him capable of handling men in the future. Such a training is now furnished by the cooperative system of education, and example of which is the Lawrence Institute of Technology. There, the student spends half of his five years in college, in actual work in the factory. Industry must prospect for its future executives. By this cooperative method of education an ideal arrangement is furnished for this purpose.

Next comes the need for stabilizing factors. Whenever a flock of wild ducks in migrating, the weak or lame ones are carried by the slip-stream produced by the stronger ones. So, in much the same manner, many lame ducks in Industry have been carried along in the slip-stream of prosperity, produced by skilled and worthy managers. The slip-stream collapsed because the load of lame ducks became too heavy. The use of a commission for industry, I believe, is not so much to get us out of a depression, as it is to keep us out, once the wheels are turning. Inertia will keep the ball of prosperity going only for a limited time; there must be a stimulating influence to keep pushing the ball.

If a commission can be formed that will hold the confidence of industry, several such stimulating devices can be put into force. These methods can be made practical only by requiring each manufacturer to do his share of pushing the ball.

The loss to industry because of this depression will be billions of dollars; and the country has lost millions of man-hours of production. Hence there exists a huge sum of money that the nation and industry can afford to spend in protection against future depressions. In this age of scientific procedure, it should not be necessary to have panics and depressions to teach us our lessons for the future. The cut and try system is obsolete.

A depressions-prevention fund established to guarantee the pay envelope of steady employees for a regular yearly period, would kill the fear, that is so easily aroused, causing a cessation of the purchasing of non-essentials. Unless the non-essentials are purchased a depression will be threatened. Our major industries produce non-essentials. An industrial commission could force all concerns to establish such a fund. Such a fund would in a short time be large enough to sustain itself.

To keep the ball of prosperity rolling it might be well to require an increase in pay for every reduction in price. In that manner the purchasing power would be stimulated at the times a reduction in price was necessary to get sales; thus the loss would be divided between fixed charges and operating costs, instead of all being caused by fixed charges.

As confidence in the commission increased it would be possible to bring industry up to the same standards as those of our public utilities. There, the fixed charges are made as small as possible. Our plants are now in many cases two and three times as large as they should be for their yearly output. They have a load factor of about 25%. Such a factor in power plant engineering would be disgraceful. Some of our factories could save millions of dollars by salvaging half their factory equipment. The idea of a flat load curve is most desirable to all industries and to employment. However, stabilization through co-operation is required, so that all like industries will have to toe the same mark and to eliminate the lame ducks. This commission should be headed by a new cabinet member in our National Government, a Secretary of Industry.

It is better to produce at a loss than not to produce at all. In one case one may only lose $100,000 by continuing production whereas by being idle, loss, due to fixed charges, may be $1,000,000. I know one firm that has continued through this depression, at full force, fifty-two weeks in the year and selling below cost. They lost about 16 million dollars last year. Their competitors each lost double that amount by being idle. Now, when business returns this firm will easily be able to undersell its competitors.

Organized industries are not afraid of new companies being formed that would be able to undersell them when business begins; hence this loss in fixed charges will be a part of the cost price that the public must pay in the future. It must be the great task of our generation to adjust the issue between an unfettered industrial organization and systematic industrial planning.

The excessive profits during the peaks of prosperity should be held in reserve for the losses during the valleys of depressions. If organized industry were made to suffer the losses of fixed charges as well as profits during depressions there would be few depressions, and no serious ones.

The desire for the commodities that are produced in this country did not leave over night. The demand has not changed. Neither was a surplus created suddenly. Usually a business is formed because the public demand such a service. Hence there is a reason for its existence. If by mismanagement the extent of the demand is over-estimated, the firm would usually retract to fit its load. Politically the situation is similar to the case of a son, his father's pride, being allowed to run wild without discipline, and becoming more powerful than his father. He will show his strength with pride and even appear ungrateful, but deeply rooted in his heart, is the love of son for father. All industries, organizations and individuals must not forget they are the servants, and their Government the Master.

NEWS NOTES OF THE INDUSTRY

As the new year approaches, the New York Automobile Show, to be held at the Grand Central Palace early in January, holds the spotlight of the industry.

Rules for this greatest national exhibit of manufacturers, which is the opening gun in each new automobile sales season, have been revised considerably. No energy is being spared to replace the static quality of previous shows with something dynamic. For example, gasoline and oil refiners will show how their wares are made, as a demonstration of gasoline making is an assured part of the show program. Tire manufacturers, too, are going to give a dynamic act which will show how rubber is gathered and made into tires.

Other special and unusual exhibits will include a display of the very first automobile advertisements, a comprehensive showing of art and paintings used in car, truck and accessory advertising, etc.

STRENGTH OF MATERIALS

By John M. Christman and P. F. Rossmann

All materials are subject to extension, compression, shearing, twisting, or bending as the case may be, when a force or combination of forces is applied. The materials used in the manufacture of tools and fixtures require a great force to cause any change in structure. Despite this fact, machines for doing work to close limits necessitate large sections so that the amount of distortion is negligible. However, in many cases the distortion is permissible providing that it is not sufficient to cause breakage or to take a permanent set, that is, not return to its original shape.

The point where material takes a permanent set is called the *Elastic Limit*, and is specified in weight per sq. in. Most hand books have tables indicating the elastic limits of various materials. Some tables give the elastic limit and also the commercial elastic limit or yielding point. The yielding point can readily be obtained with ordinary laboratory equipment, while the true elastic limit requires elaborate machinery. Since the yielding point is nearly the same as the elastic limit, it is used for most practical purposes instead of the elastic limit.

Material	Elastic Limit	Commercial Elastic Limit or Yielding Point
Steel	25,500 lb.	30,000 lb.

The yielding point should not be confused with the tensile strength of material. The tensile strength is the limit of weight per sq. in. which the material will sustain before it pulls apart. Compression is the limit of weight the material will sustain before it crushes. Shearing strength is the limit of weight per sq. in. before the material shears. Shearing requires two parallel forces moving in opposite direction applied to the material.

Hand books give the following tables:

Material	Tension	Compression	Shear	Elastic Limit	Yield Point	Elasticity Modulus of
Aluminum Castings	15,000	12,000	12,000	6,000		11,000,000
Soft Steel	60,000	60,000	50,000	25,500	30,000	29,000,000
Cast Iron	15,000	80,000	18,000	5,000		12,000,000

Problem: How much may a bar of soft steel 120″ long be stretched so that it will return to its original length when the load is removed, using 25,500 lb. per sq. in. as the elastic limit and 29,000,000 as the modulus of elasticity?

Solution:

$$\frac{1}{29{,}000{,}00} \times \frac{120}{1} \times \frac{25{,}500}{1},$$

or .000000034 x 120 x 25,500 = 0.105″

Problem: A steel bar 10″ long and 3″ in diameter was stretched to 10.008″ and returned to its original length when the load was removed. Will a bar 10″ long and ½″in diameter return to its original length when stretched to 10.008″ and the load removed?

Solution: The amount of stretch that bars of the same material and length will stand without exceeding the elastic limit is the same. Therefore, the answer is yes.

Speaking of the versatility of tool engineers, here are a couple of directors of the ASTE pinch hitting for sky light painters. This is the stuff that licks depressions.

MEETING POP HALF WAY

"Young man, do you think you can support my daughter on forty dollars a week?"

"I'm willing to try, sir—if that's the best you can do."

FOR RENT

Would you like to live in a place like this? Seven room house, Rosedale Park section, four bed rooms, complete bath room upstairs, and washrooms and toilet downstairs. Private play ground for tennis, baseball, or ither sports, skating rink in winter. Flower garden, large vegetable garden, grape arbor, strawberries and raspberries, two car garage with additional space for garden or play ground equipment. Large electric refrigerator and Chambers gas stove. We will give lease at reasonable terms to responsible party. Call or write to Publicity Committee — Madison 5048.

Tool Engineering Bulletin No. 9

DRILL SHARPENING I

The success or failure of any drilling operation depends, to a large extent, on proper sharpening of the drill for the work in hand. For that reason some general explanations are given below, that will aid in producing holes to the best advantage:

1. Lip Clearance

The fundamental requirements for lip clearance are, that the drill must have enough clearance to adequately care for the amount of feed per revolution, and that the clearance angle must increase as the center of the drill is approached. The reason for the latter is, that the diameter thru which a given point near the center travels is much smaller than the diameter traveled by a point at the outside of the drill, while the amount of advance, per revolution, is the same for the two points. It can therefore be seen that the angle of advance of the drill lip into the work increases as the center of the drill is approached.

As an example, the angle of advance of a one inch diameter drill, with a feed of .015 per revolution is 0 degrees 17 minutes at the periphery, while the angle of advance at a point one eighth inch from the center is 1 degree 6 minutes. Naturally the lip clearance must be increased from the periphey to the center in approximately the same proportion.

The clearance angle must be considerably greater than the angle of advance, as given above, so that a comparatively thin edge is presented to the work. At the same time the amount of clearance must not be too much, because then the cutting lip will be weakened to strains. Further, the cross section will be reduced behind the cutting edge so that the capacity for conducting away the heat generated is materially lessened. The materials to be drilled also have a bearing on the amount of lip clearance required, because of the variation in feed per revolution that is permissible.

For drilling steels the lip clearance at the periphey of the drill should be from 7° to 9°, while for cast iron and for soft materials the clearance should be 12° to 15°.

Continued—See Engineering Bulletin No. 10.

Courtesy of C. J. Oxford

National Twist Drill & Tool Co.
Detroit, Mich.

Tool Engineering Bulletin No. 10

Continued from Engineering Bulletin No. 9

2. Point Angle

The included angle of the points of drills has been established at 118° for general purpose work. In some steels it has been found, however, that a larger angle works more satisfactorily. Where there is a tendency for the drills to push out a bulge when breaking thru the work, and so leave an objectionable burr, a point angle of 135° to 145° will tend to eliminate this condition, and to produce a clean hole. A little experimental work will indicate the best point angle for a given job. When drilling some cast materials, notably certain grades of Cast Iron, it is found that a smaller point angle is desirable. Cases are on record where a point angle of 60° is found most satisfactory for drilling Cast Iron. This, however, is the extreme limit and should not be exceeded.

3. Web Thinning

The web of a drill is the non-cutting portion. This web is literally pushed thru the work by the end pressure on the drill. It follows therefore, that the web at the point should be made as thin as possible.

Because of the strains imposed on a drill it is necessary to design it with a considerable thickness of web. This maintains its rigidity and tends to securely join the two cutting edges together. This being so, the only way of eliminating excessive end thrust is by thinning the web at the point.

Extreme care must be exercised in doing this, because of the danger of destroying the cutting efficiency of the drill. The two cutting edges must be maintained of the same length and it must be seen to that the rake of the lips is not ground away.

Generally speaking the web can be reduced to one half its original thickness without danger, provided the thinning is done at the immediate point only. A method of thinning the web on drills for deep hole drilling is described in Engineering Bulletin No. 11.

4. Lip Shape

In order to break up the chips so that they will be readily ejected it is sometimes necessary to alter the shape of the lips of the drill by grinding on their faces. If it is desired to curl the chips more, this can be done by grinding more rake on the face of the lips. Care must be taken not to overdo this, because it weakens the lip.

By straightening up the face of the lips, or decreasing the rake, the chips will tend to break up in smaller pieces. Usually this tends to lower the efficiency, but may be necessary in order to properly get the chips out of the hole.

Courtesy of C. J. Oxford

National Twist Drill & Tool Co.
Detroit, Mich.

A TOOL ENGINEERING PROJECT

By SVERRE BERG, FLOYD CARLSON, CLARENCE ERICKSON, HERBERT ROYLE, LEONARD SPRENGER, TOM TOMAKICH, KENNETH WATSON, LOUIS WOKAS.

(*Continued from Last Issue*)

THE ECONOMICS OF MACHINERY SELECTION AND FIXTURE DESIGN

In those cases where it was difficult to reach a decision as to which of two or more rival machines should be purchased for performing a given operation, calculations determining the cost of the operation per piece on each of the machines were made, and the final choice of machine made in accordance with the result.

We shall give an actual example of one of our comparative operation cost calculations. For obvious reasons we cannot give the names of the machines, but shall designate the first machine, an automatic single spindle turret lathe, as machine X; and the second, a hand operated single spindle turret lathe, as machine Y.

Machine—X.
Part—Drill Press Spindle Pulley.
Production per hour on one machine—47.
Production per eight hour day—376.
Number of machines required for 1000 per day—3.

Price of one machine	$3,850.00
Cost of equipment including motor	200.00
Total cost of one machine	4050.00
Cost of 3 machines	12,150.00
Depreciation and interest (33⅓%+6%)	4779.00
Tool cost per year	2400.00
Interest on above (6%)	144.00
Total yearly depreciation and interest	7323.00
Year's production = 376 x 3 x 300	340,000
Interest and depreciation per piece = $7323.00 ÷ 340,000	$0.02154
Labor and overhead per hour = $.84 x 280% = $2.352	
Labor and overhead cost per piece = $\frac{\$2.352}{47}$ x ⅓	0.01668
Cost per piece on machine X	0.03822

In our plant, the overhead was calculated as 180 per cent of the direct labor cost. This ratio was found by dividing the total yearly overhead expense by the total yearly direct cost of labor. Hence, the combined labor and overhead rate is 280 per cent. (100% + 180%) of the wage rate for any particular operation.

It will be noticed that in determining the labor and overhead cost per piece we took a third of the hourly rate divided by the production per hour. This was done because one operator runs three machines, thereby reducing the labor cost to one-third of what it would be if there were one operator to each machine.

Machine—Y
Part—Drill Press Spindle Pulley.
Production per hour—47.
Production per eight hour day—376.
Number of machines required for 1000 per day—3

Price of one machine	$1729.00
Price of equipt. including motor	542.00
Total cost of one machine	2271.00
Cost of 3 machines	6813.00
Depreciation and interest (33⅓%+6%)	2679.78
Cost of tools per year	555.00
Interest on above (6%)	33.30
Total yearly depreciation and interest	3268.08
Year's production = 376 x 3 x 300	340,000
Interest and depreciation per piece = $3268 ÷ 340,000	$0.00961
Labor and overhead rate per hour = $.66 x 280%	$1,848
Labor and overhead cost per piece = $1.848 ÷ 47	0.03915
Cost per piece on machine Y	0.04876

Since Machine X shows a lower cost per piece for the operation we have been considering, the purchase of Machine X is indicated. The choice of Machine X means a saving of 300,000(0.04876 — 0.03822) = $3162.00 per year.

We shall now give an example of cost calculations as applied to the choice of the type of fixture to use for drilling the four $\frac{13}{32}$" holes in the base of the drill press. The time required to drill the four holes in the base if drilled singly will be four times as great as when a multiple head is used. The actual drilling time for one hole being 6 seconds, it will take 24 seconds to drill the four holes if no multiple head is employed. Therefore, there is a saving of 24 — 6 = 18 seconds per base by using a multi-head fixture.

With labor at $.66 per hour, the saving in direct labor will be

$$\frac{18}{3600} \times \$.66 = \$0.033 \text{ per piece.}$$

The following formula, developed by Professor Roe of New York University, was used to determine the number of pieces required to pay for the fixture.

$$N = \frac{I(A+B+C+1/H) + (YCSU)}{(SULC)\ (1+t)},$$

Where I is the cost of the fixture;

A—per cent allowed for interest on initial investment;

B—per cent allowed for insurance, taxes, etc.;

C—per cent allowed for ukpeep;

YCSU—set-up cost;

SULC—the saving in unit labor cost;

H—the number of years in which fixture must be written off the books;

t—the percentage ratio between overhead and labor;

N—the number of pieces which must be run off to pay for the fixture.

$$N = \frac{\$500\ (6\% + 3\tfrac{1}{2}\% + 1\% + 100\%) + \$8.00}{\dfrac{(18 \times \$.66)}{3600}\qquad (1.00 + 1.80)}$$

N=60,080 pieces.

The number of days in which the fixture will pay for itself will be

$$\frac{60{,}080}{1000} = 60 \text{ days.}$$

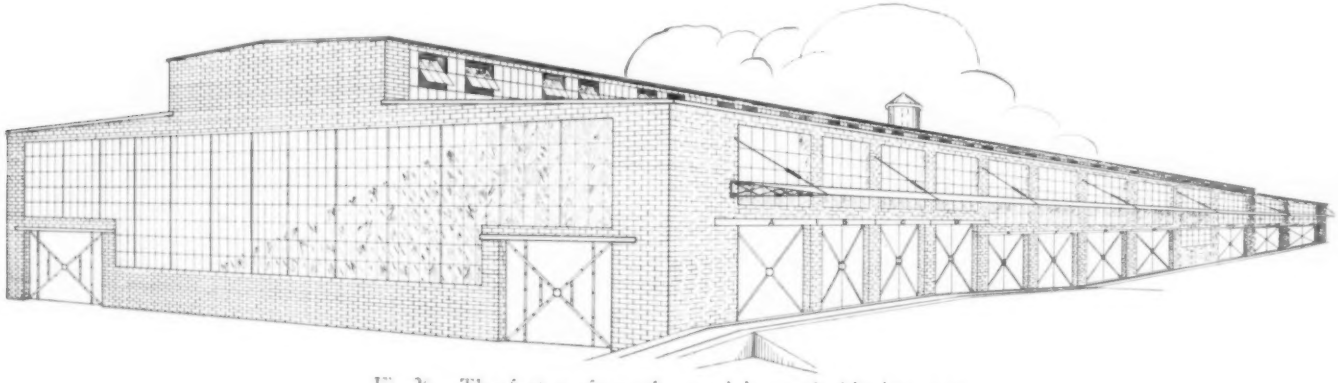
Fig. 26 shows a view of the factory from the shipping and receiving side, and Fig. 27 the complete floor layout of the plant. Fig. 27-A is a chart showing the various details of the drill press and their routing through the plant. It will be stimulating to trace the path of the details from the several material receiving stations, through the machines, to the sub and final assembly stations along the final belt conveyor on which the drill press is assembled, by referring back and forth between the floor layout drawing and the chart.

To facilitate a clearer understanding of the use of the chart, we shall give a complete description of the routing and machining of one of the details, the arm, shown in the second column from the right in Fig. 27-A.

The castings for the arm are delivered to the plant daily in lots of 1025 pieces, weighing 4 tons to the shipment. The 25 pieces in excess of the 1000 required for a day's production are a margin of safety against loss through scrap. This practice of allowing 2½ per cent. for scrap was followed throughout in our ordering of material. The castings arrive at station B (see top of Fig. 27), and come into plant in metal tote boxes holding twenty pieces each. A series of overhead, chain, gravity conveyors, a side view of which is shown on the upper right hand side of the plant layout drawing (Fig. 27), carry the loaded tote boxes to the roller conveyor stand as shown in the drawing. The empty boxes are returned on the lower portion of the conveyors. Brakes are provided on the series of conveyors at the highest point. These brakes can be released at both the loading and the receiving end by levers operated by overhead cables.

A six-spindle drill press (C1 on the plant layout drawing), one operator to the spindle, performs the first five operations on the arm. Spindles 1 and 2 (starting at the left) are used to core drill, and spindles 2 and 3 to rough bore and finish ream the spindle hole X. Spindle 2 is used for core drilling part of the time, and the remainder of the time for rough boring and finish reaming. The rough boring and finish reaming are performed in one pass. The cored spindle hole is cast ⅛" (on diameter) under the finished nominal size. Spindle 4, in one pass, rough bores and finish reams the column hole Y. Two spindles are required for the pinion hole Z, one of which performs the core drilling operation, while the other, also in one pass, rough bores and reams the hole. The parts are passed from spindle to spindle by hand.

The parts are put on a stand near disc grinder B-1, where the motor face ff is ground. The casting is next placed on a stand between the drill press C2 and the disc grinder, from which the disc grinder operator takes it to perform the hollow milling operation on the diameter f to which the pulley fits.



Fi. 26. The factory from the receiving and shipping side.

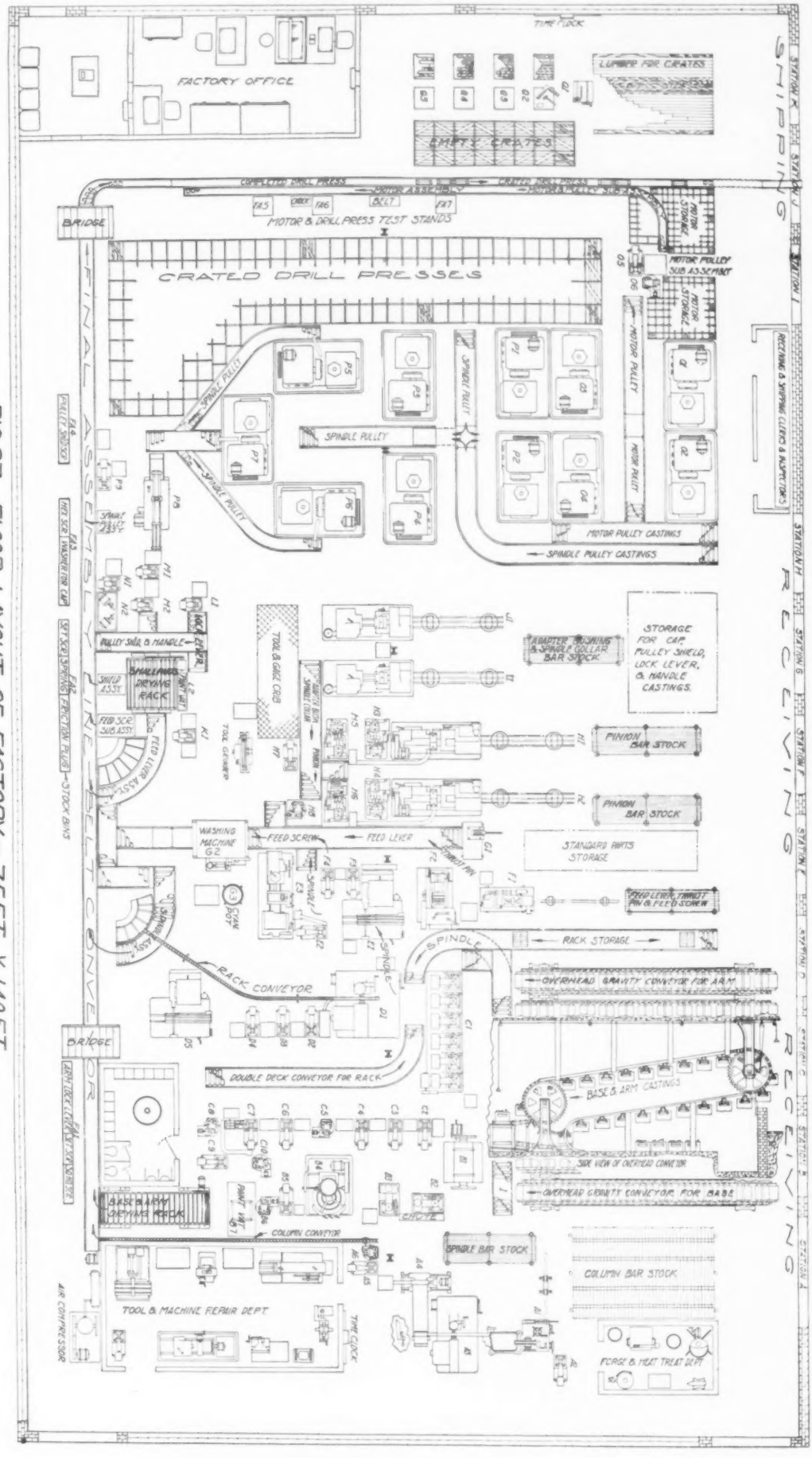


FIG 27. FLOOR LAYOUT OF FACTORY – 75 FT. X 140 FT.

Fig. 27-A. Chart showing routing of details.

The part is now placed on a stand near drill press C3, from which the next operator takes it to spot face both sides of the spindle bore Z. This operator places the casting on a stand ready for the next operator, who drills the hole for the acme tap on drill press C4. The casting is then placed upon a plate adjacent to the tapping machine C5, from which the following operator takes it to perform the tapping operation. The four motor bolt holes are drilled on drill press C6, fitted with a multiple head. The operator takes the parts off a plate, loaded by the previous operator. The part is then placed on another plate, ready for the next operator who drills the $^{27}/_{64}$" holes and the $^{5}/_{16}$" tapped hole. These drilling operations are performed on drill press C7, which also is equipped with a multiple head. There are two holes to be drilled vertically and one horizontally. The multi-head drills the vertical holes, and a drilling unit, attached to the same machine, drills the horizontal hole. The next operator takes the part off a plate, and on tapping machine C8 taps the $^{5}/_{16}$—18 and the ½—13 U.S.S. holes.

A chute now conveys the casting to drill press C9, where the two oil holes and the ¼" tapped hole are drilled by the next operator. Tapping is performed by another operator on tap machine C10, the casting being carried to this tap machine by chute. When the tapping is finished, the operator places the part on a bench, where the next operator cleans the arm with compressed air, inspects it, and plugs all machined holes, preparatory to dipping in the paint vat B7. The parts are dried on a rotary drying rack, which will be described later, located near the main assembly conveyor, thus leaving the arms in position for assembling. English red is used for painting the cast iron details of the drill press.

SUB-ASSEMBLY OPERATIONS

There are five sub-assembly stations, so located along the main assembly line that the sub-assembler has only to lay completed sub-assembly units on the main assembly belt conveyor when his operation is completed.

At the spindle assembly station, at the end of the rack conveyor, the spindle sub-assembly unit, shown in Fig. 28, is assembled.

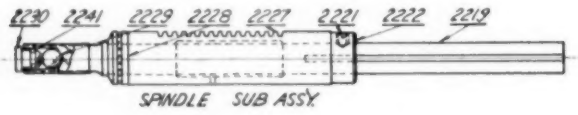


Fig. 28. Spindle sub-assembly unit.

At the feed lever assembly station, the feed lever and pinion (Fig. 29) are assembled by an operator using a special fixture.

The feed screw, cap, handle, washers, and dowel pins (Fig. 30) are assembled at the feed screw sub-assembly station.

At the shield assembly station, the name plate is attached to the pulley shield (Fig. 31). The operator uses a hammer and a special fixture having two small, anvil-like projections, against which the rivets are peened.

A special fixture assists in the operation of inserting the key in the keyway of the spindle pulley, at the spindle pulley assembly station. Fig. 32 shows this sub-assembly unit.

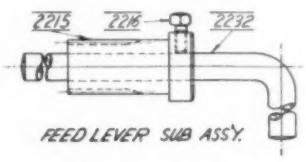


Fig. 29. Feed Lever sub assembly unit.

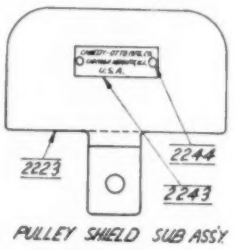


Fig. 31. Pulley Shield sub-assembly unit.

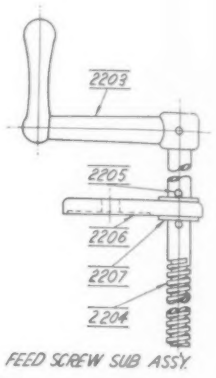


Fig. 30. Feed Screw sub-assembly unit.

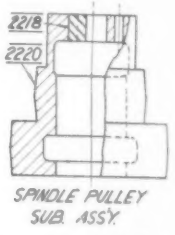


Fig. 32. Spindle Pulley sub-assembly unit.

Standard parts, such as screws, dowel pins, washers, and bolts, are kept in bins at the various sub-assembly stations. Shipments of standard parts are received once a month.

The motors are received at station I every other day, and are stored at the motor storage.

The total number of men required for the sub-assembly stations is four. Each station requires one man except the spindle pulley sub-assembly, where one man assembles the key to the spindle pulley and also operates drill press P9.

(*Continued next issue*)

A Jew and a Scotchman were arrested for being drunk and disorderly. When they were brought into court the judge asked the officer where the third man was.

"Your Honor, there was no third man."

"There must have been. Who bought the liquor?"

PERILS OF PROSPERITY

Proud Papa: Don't you think it's about time the baby learned to say "Papa"?

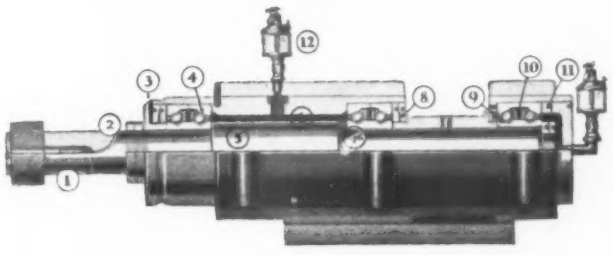
Mother: Oh, no. I hadn't intended telling him who you are until he becomes a little stronger.

Patient: "Doctor, are you sure this is pneumonia? Sometimes doctors prescribe for pneumonia and patients die of something else."

Doctor (with dignity): "When I prescribe for pneumonia you die of pneumonia."

High Production Precision Grinding Spindles

XLO Spindles are Adaptable to all Makes of Internal Grinders



A Cross Sectional View of an Ex-Cell-O Internal Grinding Spindle Illustrating General Construction.

1. Concentricity and misaligment held to .005" or less on projections.
2. Either quill or solid projection can be furnished.
3. Dust cap, close fitting prevents water and abrasive from reaching bearings.
4. XLO developed bearing held to .0003" maximum end and radial play.
5. Shaft liberally designed eliminating vibration.
6. Large oil pockets provide proper lubrication.
7. Bearing fits on shaft ground to .0001" limit.
8. Felt washers between lock nuts form an oil seal.
9. Outboard bearing takes belt load.
10. Special Bakelite composition ball retainers are non-friction and absorb enough oil to lubricate balls.
11. Double lock nuts used to hold all parts in place.
12. Clean oil applied to moving parts insures greater life to spindle.

Ex-Cell-O Aircraft & Tool Corporation

1200 Oakman Blvd. **Detroit, Mich.**

New and Used Machine Tools **Power Transmission**

CHARLES E. WAIN MACHINERY SALES

ELECTRIC MOTORS

7800-7810 Mack Ave., Corner Seyburn **Phone: Whittier 3913 Detroit, Mich.**

HOOKING THE COLLATERAL

"I'm sorry," said the diner who hoped to get away with it, "but I haven't any money to pay for that meal."

"That's all right," said the cashier. "We'll write your name on the wall and you can pay the next time you come in."

"Don't do that. Everybody who comes in will see it."

"Oh, no they won't. Your overcoat will be hanging over it."

"What gives you the impression that Jack and Betty are engaged?"

"She has a ring and he's broke."

SHEET METAL EQUIPMENT, SUPPLIES and STAMPINGS.

HENRY & WRIGHT High Speed Automatic and Fabricated Steel Presses in capacities ranging from 10 to 500 tons.

GRAY Sheet Metal Cleaning and Oiling Machines.

SUPERIOR Fabricated Steel Die Sets.

QUALITY Quick Process Stamping. No Expense for Dies or Tools.

DRAYER Die Service
Designing and building of Quality Dies.

SLOCUM ENGINEERING CO.

233 Curtis Bldg. — Madison 6110
2842 West Grand Blvd.
DETROIT

TOOLS AND DIES
SPECIAL MACHINERY

Commerce Pattern Foundry & Machine

COMPANY

2211 Grand River Ave. Detroit, Mich.

HY-CON

HIGH CONDUCTIVITY COPPER CASTINGS

Spot Welding Tips Butt Welding Die Bronzes

SAVE!

Send for full details on this LOWEST-PRICED METHOD of buying CARBOLOY TOOLS

$28.50

—covers complete materials including Carboloy tips and recessed shanks (for right or left hand use) for making 4 Carboloy tools. You just torch-braze, grind, and the lowest-priced Carboloy tools it is possible to buy are ready for use.

NOW—YOU CAN MAKE YOUR OWN CARBOLOY TOOLS AT A LARGE SAVING IN COST ! ! ! !

With this new $28.50 Carboloy Tool Manufacturing Kit you can make—in your own plant—4 Carboloy tools sizes $\frac{3}{8}$" square to $\frac{5}{8}$ x $1\frac{1}{4}$, either right or left hand—actually a choice of 8 general purpose tools with a total finished value of over $80.00. It's the easiest, lowest-priced method yet offered to make a large saving on single-tipped Carboloy tools, and the most convenient way to stock Carboloy tools for regular and rush jobs at a low investment cost.

Write for full details and start reducing cemented carbide tool costs at once.

CARBOLOY COMPANY, INC.
DETROIT, MICHIGAN
Chicago Cleveland Newark
Philadelphia Pittsburgh

Carboloy Company, Inc.
2483 E. Grand Blvd., Detroit, Mich.
Send us FREE booklet showing how we can save by making our own Carboloy tools.

Name_____

Company_____

City _____ State _____

GULLBERG SALES & MFG. CO., INC.

COMPLETE LINE OF DIE MAKERS SUPPLIES

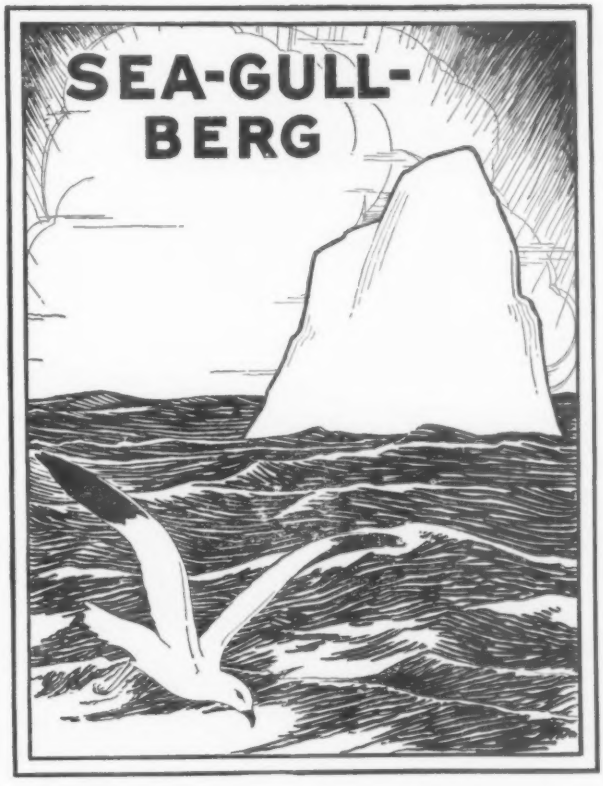
Standard die sets.

Steel shoe die sets.

Special die sets of every description made to order on short notice.

Also

Welded, built-up steel die sets.



Accessories.

Dowel pins.

Cap screws.

Die springs.

Stripper bolts.

Leader pins, standard, centerless ground, straight leader pins.

Leader pins .015 to .020 over size in the rough, but carbonized and hardened shoulder pins.

Bushings of bronze, steel, or cast iron.

QUOTATIONS GLADLY SUBMITTED UPON REQUEST ON SPECIAL DIE SETS REGARDLESS OF SIZE OR DESIGN.

840 WEST BALTIMORE MADISON 2460

DETROIT, MICH.

MISTER MANUFACTURER

Now is the Time to Advertise

Why Not Let the

ASTE Journal

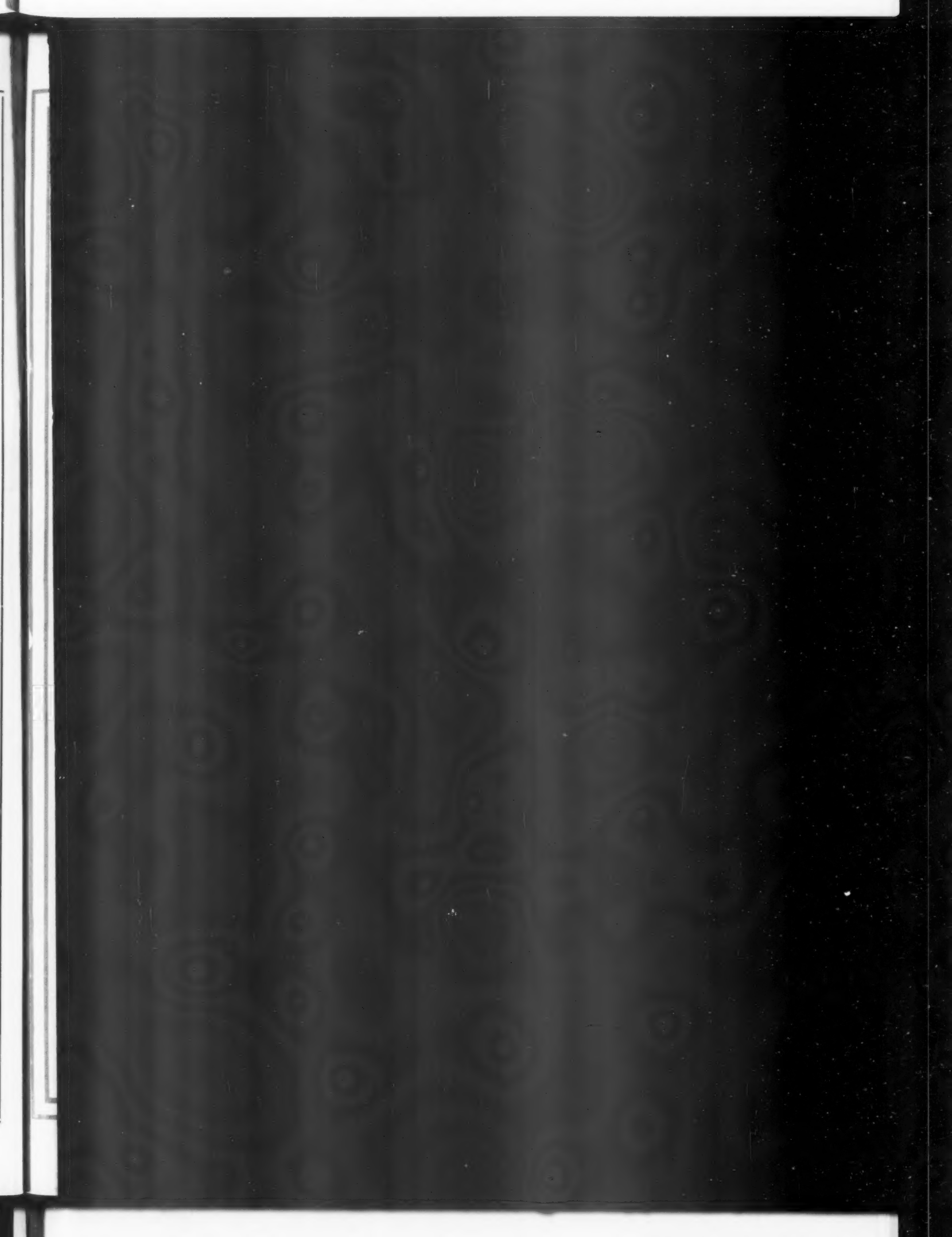
Broadcast The Story of Your Product

CONSIDER THESE FACTS

We reach every large and small industrial plant in Greater Detroit. Our paper is being read by the Master Mechanics—Tool Engineers —Tool Designers in every important plant in Greater Detroit.

WRITE OR PHONE FOR RATES NOW

American Society of Tool Engineers

Publicity Committee

8203 Woodward Ave. Madison 5048 Detroit, Mich.